burned is assumed, according to the operating condition of the furnaces to be designed.

3. The theoretical calorific intensity of the combustible, with the assumed excess air supply over that theoretically required, LS computed. *W*

4. The following temperatures have been established for the gases leaving the heating chambers of furnaces:

Open-hearth furnaces..... 1600°
Puddling and reverberatory furnaces .....1250°
Tempering or heat treating furnaces .....850°
Annealing furnaces, etc..... 1000°

5. The difference between the computed temperature, or the theoretical calorific intensity, and the temperature of the gases leaving the heating chamber is divided by the number of degrees of temperature drop of the gases per second. This determines the length of time during which the hot gases remain in the heating chamber.

6. Dividing the volume of the heating chamber by the time during which the hot gases remain in it gives Q_t, the volume of the gas at the temperature £, which passes through the heating chamber each second. This value divided by *1+al,* gives the volume of the gases at 0°, and, according to the volume of gases required at 0°, the quantity of fuel required per second, per hour or per twenty-four hours will be fixed.

7. Knowing Q_h according to formulas previously given, the *principal dimensions* of the furnace may be determined. This is done by fixing the velocity of flow of the gases in the different parts of the furnace, and then computing, according to the conditions, the hydrostatic pressure of the gases and the vertical dis-

^*Note by translator*:—This maybe done by the use of the methods of Mallard and Le Chatelier. The theoretical calorific intensity, however, assumes that combustion occurs instantaneously in an athermal chamber, the total amount ot heat released being absorbed in increasing the

temperature of the products of combustion. In practice the velocity of combustion is not instantaneous but requires an appreciable time interval; the chamber in which combustion occurs is more or less dithermal and for this reason the practical or actually obtained calorific intensity is less than the theoretical. A further difference is due to the fact that the fuel usually contains more or less moisture, gases being frequently saturated to the dew-point temperature, and in addition the air supply contains some moisture. The design and construction of the furnace affect the result.